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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 10/631,328 | 07/30/2003 | Kumar Nagarajan | 00-253/ID 81605 | 9915 |
| 7590 | 04/22/2004 | | EXAMINER | |
| Leo J. Peters LSI Logic Corporation MS D-106 1551 McCarthy Blvd. Milpitas, CA 95035 | | | SMITH, BRADLEY | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2824 | |
| DATE MAILED: 04/22/2004 | | | | |

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/631,328

Applicant(s)

NAGARAJAN ET AL.

Examiner

Bradley K Smith

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 5-8 is/are rejected.
- 7) ☒ Claim(s) 4,9 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☒ Other: Search notes.

DETAILED ACTION

Priority

1. If applicant desires priority under 35 U.S.C. 121 based upon a previously filed application, specific reference to the earlier filed application must be made in the instant application. For benefit claims under 35 U.S.C. 120, 121 or 365(c), the reference must include the relationship (i.e., continuation, divisional, or continuation-in-part) of the applications. This should appear as the first sentence of the specification following the title, preferably as a separate paragraph unless it appears in an application data sheet. The status of nonprovisional parent application(s) (whether patented or abandoned) should also be included. If a parent application has become a patent, the expression "now Patent No. ____" should follow the filing date of the parent application. If a parent application has become abandoned, the expression "now abandoned" should follow the filing date of the parent application.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-3, 4-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagarajan et al. (US Patent 6,441,499) in view of Capote et al. (US Patent 6,335,571). Nagarajan et al. disclose reducing the thickness of a die from a wafer thickness to a selected thickness to make a thin die for reducing mismatch of a coefficient of thermal

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expansion of the thin die to that of a substrate ((202) see column 2 lines 42-44); and bonding the die to the substrate via a plurality of wafer bumps ((110) see column 2 lines 63-67) on the thin die to make electrical contact between the thin die and the substrate. With regards to claims 2 and 7, Nagarajan et al. disclose the die thickness is less than 500 microns. With regards to claims 5 Nagarajan et al. disclose the step of underfilling (see column 2 lines 25-34). However Nagarajan fails to disclose the forming a plurality of thin film layers on the thin die wherein each of the thin film layers has a coefficient of thermal expansion that is greater than that of the thin die and is less than that of the substrate. Whereas Capote et al discloses the forming a plurality of thin film layers on the thin die wherein each of the thin film layers has a coefficient of thermal expansion that is greater than that of the thin die and is less than that of the substrate (see column 7 lines 18-35 and column 8 lines 1-5). With regards to claims 3 and 8, wherein at least one of the thin film layers comprises an adhesive (encapsulant). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Nagarajan et al. and Capote et al. in order to form a plurality of thin film layers, because the use of a plurality of layers will have the essential properties to reduce solder joint fatigue (see column 7 lines 55-60).

Allowable Subject Matter

4. Claims 4 and 9 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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5. The following is a statement of reasons for the indication of allowable subject matter: the prior art of record neither teaches nor suggests the first second and third thin film layer having successively graduated coefficients of thermal expansion from about 7-10 parts per million per degree Kelvin for the first thin film layer, 10-14 parts per million per degree Kelvin for the second thin film layer, and 15-19 parts per million per degree Kelvin for the third thin film layer, respectively.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bradley K Smith whose telephone number is (571)272-1884. The examiner can normally be reached on 10-6 Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Elms can be reached on (571) 272-1869. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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A handwritten signature in black ink, appearing to be 'BKS', written in a cursive style.

BKS